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What is claimed is:

1. An enriched population of mammalian neural precursor cells committed to a cell fate, said cells being characterized in that they exhibit a stem cell phenotype in the presence of a Wnt polypeptide but not in the absence of said Wnt polypeptide.
2. An enriched population of mammalian dopaminergic neuron precursor cells, said cells being characterized in that they exhibit a stem cell phenotype in the presence of a Wnt polypeptide and differentiate into dopaminergic neurons in the absence of said Wnt polypeptide.
3. The population of claim 2, wherein said Wnt polypeptide is a Wnt-1 class polypeptide.
4. The population of claim 3, wherein said Wnt polypeptide is selected from the group consisting of Wnt-1, Wnt-2, Wnt-3a, Wnt-7a, and Wnt-7b.
5. The population of claim 4, wherein said Wnt polypeptide is Wnt-1.
6. The population of claim 5, wherein said Wnt-1 polypeptide has a sequence that is at least 80% identical to SEQ ID NO: (human Wnt-1).
7. The population of claim 2, wherein said cells are human cells.
8. The population of claim 7, wherein said cells are fetal human cells.
9. The population of claim 2, wherein said cells are porcine cells.

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10. An enriched population of mammalian dorsal hindbrain precursor cells, said cells being characterized in that they exhibit a stem cell phenotype in the presence of both a Wnt-1 polypeptide and a Wnt-3a polypeptide but not in
5 the absence of said Wnt-1 polypeptide and said Wnt-3a polypeptide.

11. An enriched population of mammalian hippocampal neuron precursor cells, said cells being characterized in that they exhibit a stem cell phenotype in the presence of a
10 Wnt-3a polypeptide and differentiate into hippocampal neurons in the absence of said Wnt-3a polypeptide..

12. The population of claim 11, wherein said Wnt-3a polypeptide has a sequence that is at least 80% identical to SEQ ID NO: (mouse Wnt-3a).

13. The population of claim 11, wherein said cells
15 are human cells.

14. A method of treating a heterogeneous population of neural cell precursor cells to enrich for dorsal neural precursor cells, comprising culturing said population with
20 Wnt polypeptide, wherein said dorsal neural precursor cells selectively proliferate in the presence of said Wnt polypeptide.

15. A method of stimulating cell proliferation of a dorsal neural precursor cell comprising contacting said cell
25 with a Wnt-1 polypeptide or a Wnt-3a polypeptide.

16. The method of claim 15, wherein said cell is contacted with both a Wnt-1 polypeptide and a Wnt-3a polypeptide.

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17. A method of inducing neuronal regeneration in an adult mammal suffering from a neurodegenerative disorder, comprising transplanting into said mammal an enriched population of dorsal neural precursor cells.

5 18. The method of claim 17, wherein said disorder is Parkinson's Disease, Amyotrophic Lateral Sclerosis, Diffuse Lewy Body Disease, Cortical-basal Ganglionic Degeneration, Hallervorden-Spatz Disease, or Myoclonic Epilepsy.

10 19. The method of claim 17, further comprising administering to said mammal a Wnt polypeptide or Wnt agonist.

15 20. A method of treating Parkinson's disease, comprising transplanting into the brain of a patient an enriched population of dopaminergic neuron precursor cells.

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